

METHOD OF FORMING NANO-CRYSTALLINE STRUCTURES AND PRODUCT FORMED THEREOF

Abstract

A product in which at least a portion of the product has a nanocrystalline microstructure, and a method of forming the product. The method generally entails machining a body in a manner that produces chips consisting entirely of nano-crystals as a result of the machining operation imposing a sufficiently large strain deformation. The body can be formed of a variety of materials, including metal, metal alloy and ceramic materials. Furthermore, the body may have a microstructure that is essentially free of nano-crystals, and may even have a single-crystal microstructure. The chips produced by the machining operation may be in the form of particulates, ribbons, wires, filaments and/or platelets. The chips are then used to form the product. According to one aspect of the invention, the chips are consolidated to form the product, such that the product is a monolithic material that may contain nano-crystals. According to another aspect of the invention, the chips are dispersed in a matrix material, such that the

product is a composite material in which the chips serve as a reinforcement material.